

Phytotoxicities of Oils, Dispersants and Dispersed Oil: A Synoptic Review, Michael Lewis,
USEPA, Gulf Ecology Division, Gulf Breeze, Florida 32561

This presentation will summarize the published data (1975-present) on toxic effects of petrochemicals on algae, phytoplankton, wetland plants, mangroves and seagrasses. Oils and dispersants are difficult to study toxicologically; this difficulty is compounded when the test species are plants. Aquatic plants have varied morphologies, physiologies and life history characteristics that impact the experimental design and relevancy of results. Most information on the effects of oils and remediation products are based on post-oil spill observations. Toxic effect concentrations are relatively uncommon, particularly those from dose-response studies. Standard toxicity test methods are not available for most aquatic vascular plants and experimental conditions vary widely. With the exception of microalgae, cultured and field-collected seedlings have been usually exposed in sediment contained in pots for periods between four hours to one year. Sublethal effects on growth, pigment content and photosynthetic activity have been more commonly measured than lethality. Inhibition and, to a lesser extent, stimulation and recovery have been reported. Toxic effect concentrations are available for at least 18 algal, 13 wetland plant, 6 mangrove and 7 seagrass species and 20 crude oils and 18 dispersants. Most dispersant information is for algae (nine dispersants) and the least for intertidal plants (two dispersants). Algae and wetland plants have been exposed to more oils (nine) than other aquatic plants. Tests conducted with different species and the same petrochemicals and those conducted with the same species and different petrochemicals using similar test designs have not been commonly reported. As a result, the reported database does not support a ranking of toxicities, species sensitivities and sensitive response parameters. Furthermore, the database is not useful to reliably predict phytotoxicities of current dispersants, oils and their combinations prior to and during spill events. Compounded with the usual lack of information on dispersant exposure concentrations, toxicity-based hazard assessments will remain difficult for aquatic plants. A proactive and experimentally consistent approach is recommended to fill data gaps.